

CLAIMS

WE CLAIM:

1. A non-harmful conjugative displacing plasmid for displacing a harmful plasmid comprising:
 - a) an origin of replication for synthesizing the non-harmful conjugative displacing plasmid in a bacterial cell;
 - b) an element that can inhibit the replication of the harmful plasmid located outside the origin of replication; and
 - c) an origin of transfer from which conjugative transfer of the non-harmful conjugative displacing plasmid initiates from a donor bacterial cell to at least one recipient bacterial cell.
2. The non-harmful conjugative displacing plasmid of claim 1 wherein the element that can inhibit the replication of the harmful plasmid is an iteron used by the harmful plasmid for replication.
3. The non-harmful conjugative displacing plasmid of claim 2 further comprising: at least one screenable marker gene.
4. The non-harmful conjugative displacing plasmid of claim 2 further comprising: at least one transfer gene for transferring the non-harmful conjugative displacing plasmid from a donor bacterial cell to a recipient bacterial cell.
5. The non-harmful conjugative displacing plasmid of claim 2, wherein the non-harmful conjugative displacing plasmid is R6K containing at least three copies of R6K iteron outside the origin of replication.
6. A donor cell comprising:
 - a non-harmful conjugative displacing plasmid of claim 1;
 - all transfer genes necessary for conferring upon the donor cell the ability to conjugatively transfer the non-harmful conjugative displacing plasmid from the donor cell to a recipient bacterial cell.

7. The donor cell of claim 6, wherein at least some of the transfer genes are carried by a helper plasmid within the donor cell or by the donor cell genome, such that the non-harmful conjugative displacing plasmid is transmissible from the donor cell to a recipient bacterial cell, but is not further self-transmissible from the recipient cell to another recipient cell.

8. The donor cell of claim 6, wherein all of the transfer genes are located on the non-harmful conjugative displacing plasmid, such that the non-harmful conjugative displacing plasmid is self-transmissible from the donor cell to a recipient bacterial cell, and further from the recipient cell to another recipient cell.

9. The donor cell of claim 6, wherein the donor cell is a non-pathogenic strain of bacteria selected from the group consisting of *Escherichia coli*, *Lactobacillus spp.*, *Lactococcus*, *Bifidobacteria*, *Eubacteria*, and bacterial minicells.

10. The donor cell of claim 6, wherein the recipient bacterial cell is a pathogenic strain of bacterium selected from the group consisting of *Campylobacter spp.*, *Enterobacter spp.*, *Enterococcus spp.*, *Escherichia coli*, *Gardnerella vaginalis*, *Haemophilus spp.*, *Helicobacter pylorii*, *Mycobacterium tuberculosis*, *Propionobacter acnes*, *Pseudomonas aeruginosa* and other *Pseudomonas spp.*, *Salmonella typhimurium*, *Shigella spp.* and *Staphylococcus spp.*

11. The donor cell of claim 6, wherein the donor bacterial cell is a bacterium of strain S17.1.

12. A pharmaceutical preparation for displacing a harmful plasmid in a target bacterial population in a subject, the preparation comprising the donor cell of claim 6 formulated for a pre-determined route of administration to the subject.

13. The pharmaceutical preparation of claim 12, wherein the pre-determined route of administration is selected from the group consisting of a topical route, an oral route, a nasal route, a pulmonary route, an ophthalmic route, an aural route, a rectal route, a urogenital route, a subcutaneous route, an intraperitoneal route and an intravenous route.

14. A method for displacing a harmful plasmid with a non-harmful plasmid in a bacterial population, the method comprising the steps of:

providing a donor cell according to claim 6; and

conjugating the donor cell to a recipient bacterial cell such that a non-harmful conjugative displacing plasmid is transferred from the donor cell to the recipient cell,

wherein the nonharmful conjugative displacing plasmid inhibits replication of the harmful plasmid in the recipient cell and when the recipient bacterial cell replicates, the harmful plasmid is lost in the growing bacterial population.

15. The method of claim 14 wherein replication of the harmful plasmid involves an iteron sequence and the donor cell contains a conjugative displacing plasmid that contains the same iteron sequence outside the origin of replication.

16. The method of claim 14, wherein the non-harmful conjugative displacing plasmid is R6K carrying 3 copies of iteron of R6K.

17. The method of claim 14, wherein the recipient bacterium resides in a subject selected from a human or non-human animal, a plant, or a food source.